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(54) Title of the Invention An Adhering Process and a Cross Linking Resin Composite Material and an Adhering Device Used Therefor

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SPECIFICATION

1. Title of the Invention

An Adhering Process and a Cross Linking Resin Composite Material and an Adhering Device Used Therefor

2. What we claim is :

An adhering process characterized in that an electrically conductive heat

generating material (2) is made unitary with or put along a cross linking resin composition (1), which is then put along a member which is required to be made unitary by a cross linking resin adhesive, an electric current is allowed to flow through the above - mentioned electrically conductive heat generating material (2), thereby allowing an eddy current to be generated by a magnetic field and the cross linking of the cross linking resin is allowed to proceed by the heat thus generated, thereby achieving the adhesion.

2. A cross linking resin composite material comprising a cross linking resin composition (1) and an electrically conductive heat generating material (2).

3. A cross linking resin composite material, in accordance with Claim 2, characterized in that the electrically conductive heat generating material (2) comprises an electrically conductive heat generating fiber such as a carbon fiber and a metal fiber, a yarn body thereof or a cloth thereof.

4. A cross linking resin composite material, in accordance with Claim 2, characterized in that the electrically conductive heat generating material

(2) is an electrically conductive metal foil of iron, stainless steel, etc.

5. An adhering device characterized by comprising a coil section (11) by which to generate an eddy current in an electrically conductive heat generating material (2) which is in close contact with or brought close to a cross linking resin composite material (1) and a power supply section (12) by which to send a high frequency current to the above - mentioned coil section (11).

6. An adhering device, in accordance with Claim 5, characterized in that the power supply section (12) comprises an oscillation section of a high frequency current, an output adjusting section (13) of a high frequency current, a detection section (14) of an output current value, and an operational control section (15) of a detected value obtained in the detection section (14).

7. An adhering device, in accordance with Claim 5, characterized in that the power supply section comprises an oscillation section of a high frequency current, an output adjusting section (13) of a high frequency current, and a detection section by which to detect an input current to

make a heating power of an electrically conductive heat generating material (2) constant and to detect a signal for correcting a set value of an output setting circuit.

3. Detailed Explanation of the Invention

[Utilization Field in the Industry]

The present invention relates to a cross linking process and a cross linking resin composite material which are used for assembly of an anti-vibration structural member for a building, etc., for an anti- vibration support of a machine which generates vibration, water proof covering, repair of a crack, adhesion and assembly of a structural member, adhesion of ribber materials to each other, etc. by the utilization of the adhering function which a rubber series adhesive which displays adhesiveness as a result of curing or vulcanization, a thermosetting resin series adhesive (hereinafter referred to as a cross linking resin adhesive agent in the present invention) such as a melamine resin, a xylene resin, an epoxy resin, an isocynate resin, and an unsaturated polyester resin, a

phenol resin and an urea resin, etc. have.

[Conventional Technology]

Formerly and conventionally, in a case in which use is made of a cross linking resin adhesive agent for the above - mentioned purpose, since there is no appropriate heating means in the field by which to quickly complete curing or rubber or cross linking when these materials are used in a construction or building site, a maintenance site, a machinery installation site, a building repair site, a rubber product manufacturing site, etc., for example, an already cured material of a block form or a sheet form is adhered, or a fastening means is provided and it is fixed by a physical or mechanical means such as screwing and caulking. To provide such a fastening means to press while being heated a metal fixture and uncured rubber in a curing vessel or in a mold, and to heat, cure and adhere them at once. (For example, see Japanese Patent Gazette, Patent Publication No. Sho 59 / 1984 - 51905). Such a fixing means can be adopted for a member the size of which is not large, however, it can not be adopted to a rubber material which is to be used

for building support structural member, a duct a vibration generating machine, etc.

In addition to the problem of a size, there have been a site and a field where cross linkage and curing can not be achieved by a conventional means. This is due to the fact that it has not been possible to hope for rapid curing and simultaneous adhesion and cross linking and thermal setting at the time when a rubber material is installed with a purpose of rendering a buffer or vibration control with respect to the inside of a machine or at the time an elastic material or structural member is installed as part of the structure of a bridge or a building.

[Problem Points which the Inventions Tries to Solve]

Therefore, the present invention is to provide an adhering method, which has not existed so far, by which to make it possible to rapid curing and cross linking by heating for such a section or a location for which it has been impossible to do so formerly, or a large size. It is a matter of course that the present invention does not limit a size of an article to be adhered or an article to be cured.

[Means by which to Solve the Problem Points]

Therefore, in order to solve the above - mentioned conventional problem points, with the present invention, there has been developed an adhering process characterized in that an electrically conductive heat generating material (2) is made unitary with or put along a cross linking resin composition (1), which is then put along a member which is required to be made unitary by a cross linking resin adhesive, an electric current is allowed to flow through the above - mentioned electrically conductive heat generating material (2), thereby allowing an eddy current to be generated by a magnetic field and the cross linking of the cross linking resin is allowed to proceed by the heat thus generated, thereby achieving the adhesion.

Here a member which is required to made unitary with another member by means of a cross linking resin adhesive agent means (sic) the production or manufacturing, etc. of a structural product support material such as a base material, a decorative plate, a floor finish material, a wall face finish material, etc., at the time of building construction, an anti-

vibration element product made by the adhesion of rubber and rubber or rubber and other material, a ceiling and a wall where a crack is generated, as mentioned above (sic), and it also includes the shortening of time for those which have conventionally adhered (sic).

In addition, the present invention has developed at the same time a cross linking resin composite material comprising a cross linking resin composition (1) and an electrically conductive heat generating material (2), which compound makes such a working process possible.

A electrically conductive heat generating material (2) as defined in the present invention means a fiber which generates heat when an electric current is allowed to flow therethrough, such as a carbon fiber and a metal fiber, a yarn product and a cloth (including non- woven cloth) produced by processing the above, furthermore an electrically conductive foil such an iron foil and a stainless steel foil, a metal and a metal flake which generates heat when an eddy current is generated in a magnetic field, etc.

As to the cross linking resin in the present invention, although there is not

any special limitation to the following, the above - mentioned thermal setting resins, and rubber series adhesive agents such as IR, IIR, BR, CR, SBR, NBR, and EPR are included. In addition, those which render an adhesive property through cross linking when heated, such as a urethane resin and a silicone resin are included.

In addition to these, it is possible to use arbitrarily a curing agent (a cross linking agent), a cure accelerating agent (cross linking accelerating agent), a filler such as calcium carbonate, magnesium carbonate and carbon, and if necessary, a dehydrating agent by which to restrict bubble generation, an oil, a blending agent such as a plasticizer agent.

In order to make such as cross linking resin composition (1) unitary with, or to allow it to be put along, the electrically conductive heat generating material (2), in a case of a heat generating fiber such as a carbon fiber and a metal fiber when an electric current is allowed to flow therethrough, or a yarn product or a cloth thereof, such an electrically conductive heat generating material (2) is Immersed (dipped) in a cross linking resin composition of a liquid form or is roll - coated with it,

thereby making it to assume an impregnated state. In addition, in a case in which a cross linking resin composition has viscosity of a higher degree than a paste material, or is of a film form, a coating process, a lamination process, a close attachment process, etc. may be used.

In a case in which an electrically conductive heat generating material (2) is an electrically conductive metal foil such as an iron foil and a stainless steel foil, in order to make it a unitary body with an uncured rubber material composition (1), close - contact unitarization of these materials, a lamination process thereof, etc. may be used. Another process for the unitarization thereof is to generate heat to the extent no to cause curing by allowing an electric current to flow through an electrically conductive heat generating material (2) or rendering a magnetic field energy thereto, and to adhere these materials to each other.

In a case in which an electrically conductive heat generating material is a metal such as iron and stainless steel which is heated by generating an eddy current in a magnetic field, it is possible to utilize the unitarization by a similar process as described above or in a case of a film, to allow it

to be put along the other member.

To allow an electric current to flow through an electrically conductive heat generating material (2) and to generate heat therein means to increase the temperature of the electrically conductive heat generating material to a room temperature or higher by the current density. In the present invention, it is possible for an electrically conductive heat generating material to utilize heat generated by an eddy current due to a magnetic field energy.

In the present invention, an article obtained by making an electrically conductive heat generating material (2) unitary with or putting it along a cross linking resin composition (1) is put along a member which is required to be made unitary with a rubber material which has already been cured, or with other cross linking resin. As to a member which is to be made unitary with a rubber material which has already been cured, it means for example unitarization of a weather strip of a car to a window frame section, or unitarization and adhesion of cured rubber or a synthetic resin having rubber elasticity to a metal member, a wood

member, a plastic or ceramic, etc. A member which is to be made unitary by a cross linking resin means a member which is to be adhered by use of a simultaneous cure and adhesion type adhesive agent. The adhering of a rubber belt by butting the ends thereof at the time of manufacturing of an endless rubber belt is included in this.

In order to put it along these members, it may be put along a surface of a member which is required to be adhered, or in a case in which a material to be adhered has a mortise or a mortise hole, a cross linking resin composition (1) and an electrically conductive heat generating material (2) are brought into close contact thereof, or it is filled with them.

After heat is rendered to a cross linking resin composition (1), when the heating is stopped by the stoppage of a current flow or the application of a magnetic field energy, depending on a cross linking resin composition, which is a raw material, adhesion may be immediately achieved in such a manner that it may be impossible to peel off, or a good adhesion state may be achieved after several minutes. In the latter case, it is possible to use a rapid setting type adhesive such as a hot melt adhesive together

with a cross linking resin composition. That is to say, in a case in which a member which is required to be adhered is a wooden decorative plate and in a case in which this is to be adhered to a wooden base material, if an uncured rubber material composition is a slow setting composition such as NR and IR, in general, it is left undisturbed about a whole day and night while waiting the completion of adhesion, and the one made by making unitary a hot melt adhesive agent and an electrically conductive heat generating material in the neighborhood of a unitarized member of a cross linking resin composition and an electrically conductive heat generating material in accordance with the present invention is utilized for quick temporary adhesion.

The volume of a current flow through the one obtained by the unitarization of an uncured rubber material composition and an electrically conductive heat generating material in accordance with the present invention is to be adjusted depending on a material, thickness, and size of an electrically conductive heat generating material, a quantity of an uncured rubber material composition, a temperature at which the

curing becomes possible, etc. In a case of heating by a magnetic field, it may be adjusted by a type, and thickness of an electrically conductive heat generating material, a distance thereto, a type, quantity and a layer thickness of a shielding material (intermediate inserted material), etc.

[Action]

With respect to a cross linking resin composite material (10) obtained by making a cross linking resin composition (1) and an electrically conductive heat generating material (2) in accordance with the present invention, when an electric current is allowed to flow therethrough or a magnetic field energy is rendered thereto, heat is generated in the electrically conductive heat generating material (2), the curing of the cross linking resin composition (1) progresses by the heat generated, a member which is made unitary with this cross linking resin composition (10) or which is put along it is adhered, and cured rubber is formed. At this time, the electrically conductive heat generating material (2) not only renders the thermal energy required for cross linking and curing to the cross linking resin compound (1) but also renders heat to a member

which is present in the neighborhood thereof and is required to be adhered, and thus it has an action by which to make it possible to render wetting required for adhesion.

The adhesion or forming by this cross linking (curing) can be carried out in the inner side which can not be seen from the outside. That is to say, since it is possible to achieve adhesion by rendering a thermal energy from the outside to the inside of wall paper or a wooden plate material while appropriately adjusting it, it is possible to paste or temporarily fixing an interior decorative material, a ceiling material or a decorative material in the construction of a building, to adhere the lower face of a free access floor and a carpet, or to form a vibration preventing body at the lower face of a building supporting material or between a constituting materials.

In the following, we shall explain the present invention in detail by referring to some examples embodying the present invention.

[Example 1]

Fig. 1 (a) and Fig. 1 (b) are respectively an obliquely seen view and a

cross sectional view which show the state of simultaneous adhering a wooden furring strip (5) to a wood block base material (4) attached to a concrete bed (3), and an interior decorative material (6) made of a wooden plywood to the inner side thereof by the process in accordance with the present invention . Between the wooden block base material (4) and the wooden furring strip (5), and between the wooden furring strip (5) and the interior decorative material (6) is present a cross linking resin composite material (10). The cross linking resin composite material (10) is a material obtained by coating both faces of an iron foil (which is an electrically conductive heat generating material (2) (27 μ in thickness, made by Toyo Kohan Co., Ltd.) with a thermosetting resin (Epoxy resin series adhesive agent, trade name :Konishi Quickset) as a cross linking resin. There is provided a pierced hole (7) having a diameter of 4 mm ϕ in this iron foil, thereby allowing the thermosetting resin to act to adhere on both faces, and thus trying to increase the adhersive strength. Fig. 2 is an obliquely seen view which shows the cross linking resin composite material (10).

Next, the adhering device in accordance with the present invention is allowed to operate from the inner side of a room to the interior decorative material (8). This device is characterized by comprising a coil section (11) by which to render a magnetic field energy to, and to generate an eddy current in, an electrically conductive heat generating material (2) and a power supply section (12) by which to send a high frequency current to the above - mentioned coil section (11). A high frequency current of 3000 Hz is allowed to flow through the coil section (11) of of this adhering device, thereby allowing the electrically conductive heat generating material (2) to generate heat, which heat is allowed to heat the cross linking resin, and while changing the locations, adhesion is carried out.

Fig. 13 shows a circuit diagram., and the power supply section (12) of this adhering device consists of an output adjusting section (13) by which to adjust the power supply quantity to the coil section (11) by which to generate an eddy current in the electrically conductive heat generating material (2), a detction section (14) by which to detect an output current,

etc. sent to the above - mentioned coil, and operational control section (15) for the detected value obtained in the detection section (14), and it transmits the result obtained in the operational control section (15) to the above - mentioned output adjusting section (13). The detection section (14) consists of a rectifying circuit (16) of a detected current obtained in the detection circuit and an A - D converter (17). The operational control section (15) consists of a micro computer. The output adjusting section (13) consists of an ignition circuit which receives an instruction from the operational control section (15) and a thyrister.

The operatoiinal section which consists of a micro computer is shown in Fig. 14, which is a flow sheet, and it can make various controls with respect to safety, and in a case in which there is not any metal planar body in which an eddy current may be generated by a magnetic flux, it stops the supply of an electric current to the coil section (11). In a case in which the cross linking of a cross linking resin progresses and there appears a change in endothermic state, or in a case in which excessive heating has take:ns place, the power supply to the coil is suspended or

supressed. In a case in which use is made of an iron foil of a thickness of 27 μ, a width of 20 cm and a length of 40 cm as an electrically conductive heat generating material, if a power of 10 V and 30 A was supplied to the coil (11), a purpose of adhesion could be achieved in 2 minutes under this condition of this example embodying the present invention.

This eddy current heating type adhering device has an operational section (15) which consists of a computer, and it is possible to achieve the object of the present invention by using a configuration in which there are provided a metal detection signal generating circuit by which to judge whether or not it is a correct electrically conductive heat generating material (2) (in which a multivibrate is constituted with an operation amplifier, a resistance element, and a capacitor, and which outputs a signal every several seconds), a heating display circuit which flashes a display lampwhen the electrically conductive heat generating material (2) is in a heated state, a start delay circuit by which to adjust a temperature due to heating of the electrically conductive heat generating material (2)

by detecting a counter - electromotive force, and a detection circuit by which to detect a signal which corrects a set value of an output setting circuit by detecting an input power.

If only the coil section (11) or the whole device is attached to a computer- controllable manipulator or a running device, it becomes possible to automate an adhering operation in various types of construction site or in a manufacturing plant.

This adhering device is not limited only to the above - mentioned example embodying the present invention, and as shown in Fig. 12, this adhering device can be adopted and used widely to adhesion of a floor surface finish material (20) such as a carpet to a floor face (21), adhesion of wall paper, a ceiling material, etc., an adhering work of an outdoor installation, etc. A composite adhesion material to be used is not limited only to this example embodying the present invention, and for example, it is possible to use the one made of a thermal adhesive agent such as a hot melt adhesive agent and an electrically conductive heat generating material.

With this adhering device, the following two cases are possible : a case in which it remains still at a location where adhesion is required, and a magnetic field energy is allowed to act upon there and a case in which it is moved gradually and a magnetic field energy is allowed to act in that manner.

Now let us return to Fig. 1 : in this example embodying the present invention, a wooden block, a furring strip and an interior decorative material are simultaneously adhered. In a case in which a magnetic field energy is large, it is possible to adhere the concrete wall face of the bed and a wooden block in a similar manner.

In a case in which a heat capacity of an adhering partner material is large, it is necessary that the adhering surface of that member is wetted with an adhesive layer. Therefore, the magnetic field energy quantity required becomes larger by that much. In a case in which the permeability and specific resistance of one of the members to be adhered or both of them are within a condition to cause heat generation by the ohmic loss due to the generation of an eddy current, the electrically conductive heat

generating material (2) is not required.

[Example 2]

100 parts of IIR (parts by weight. The same applies hereinafter.), 90 parts of calcium carbonate, and 6 parts of process oil were charged into a Banbury mixer (capacity 2 *l*), followed by stirring for 7 minutes. 5 parts of zinc white, 8 parts of CaO, and in order to increase the adhesiveness to a metal, 10 parts of epoxy modified butadiene rubber and 4 parts of tri-ally tri- mellitate were added to the kneaded product thus obtained, followed by kneading by means of a roll. This material was made into sheet of a thickness of 1 mm, which was cut into a piece of a width of 3 cm and a length of 5 cm, and this piece was used as a cross linking resin composition (1). A cross linking resin composite material (10) was prepared by pasting these pieces to both front and back faces of an electrically conductive heat generating material (2) of a band form of a stainless steel foil (30 μ in thickness) of a width of 3 cm having pierced holes of 4 mm ϕ with an interval of 10 mm, while leaving a space of 2 mm inbetween. Here the space of 2 mm is an easy-to-cut section (22),

and if perforations are made on this section, it can be cut very easily and this is convenienece.

As shown in Fig. 12, this cross linking resin composite material (10) was placed on a free access floor (23) made of a steel plate, and then a carpet (24) made of arylic fibers with raised looped fibers with a rubber cover on the back face which was to be placed on the floor, was palced thereupon. While from above this, a magnetic field energy was rendered thereto by a device having a configuration with a roller (45) appropriate for pulling the coil section (11) of the adhering device explained in the above - mentioned example embodying the present invention, simultaneous curing and adhering were done gradually. As a result of pulling the coil section (11) while allowing a current of 3000 Hz with an output of 500 W to flow through the coil section (11), the carpet was adhered in such a manner that it could not be peeled off.

Example 3 through Example 5

By using the cross linking resin composition (1) explained in Example 2, a cross linking resin composite material (10) by which it is possible to

achieve the object of the present invention when an electric current was allowed to flow therethrough as shown in Fig. 4 through Fig. 6, was prepared.

The example embodying the present invention shown in Fig. 4 is a case in which a stainless fiber (a thickness of 10 μ, SUS 304, trade name Susmic Fiber, made by Tokyo Seimo Co., Ltd.) As an electrically conductive heat generating material (2) was drawn so that it might become 2.5 mm in width. When an electric current was allowed to flow therethrough from both ends, it became a heat generating body. And the energy required for cross linking could be obtained from this.

The example embodying the present invention shown in Fig. 5 is a case in which an aluminum foil (15 μ) of a horse shoe form is used as an electrically conductive heat generating material (2).

The example embodying the present invention shown in Fig. 6 is a case in which both electric current connecting terminals can be connected by assuming a structure in which the electrically conductive heat generating material (2) is folded back at one side.

These are types which can generate heat when an electric current is allowed to flow therethrough, and by adjusting the electric current quantity to the extent scattering may take place due to thermal vibrations of the lattices, cross linking and curing are made possible.

Example 6

With the electric current connecting type so far, the terminal section of an electrically conductive heat generating material (2) is exposed, and becomes an electric power receiving terminal (26), and the example embodying the present invention shown in Fig. 9 is a case which allows an electric current may flow through even though the electric power receiving terminal is not exposed. In this case, an electric power receiving terminal (27) of a clamp type holds a cross linking resin composite material (10) in accordance with the present invention and an intermediate terminal (28) of a plate form having a large number of protrusions as shown in Fig. 8 by sandwiching them, and an electric current is allowed to flow through an electrically conductive heat generating material (2) which is in contact with the protrusions of the

intermediate terminal (28) which pierces through the resin layer from the electric power supply terminal (27).

Example 7

As shown in Fig. 10, both ends of a rubber strip (30) which could be formed into a weather strip were butted after molding, and a cross linking resin composite material (10) of a type which can be adhered when an electric current is allowed to flow therethrough was placed between the butted section. This cross linking resin composite material (10) was the one obtained by coating both faces of an aluminum foil (15 μ) with an rubber chloride series over- coat adhesive agent (trade name : Chemlock 205) and then drying.

An electric current of 0.5 V and 5 A was allowed to flow through this cross linking resin composite material (10) of an area of 1 cm^2 from both sides by a power supply device as shown in the drawing, and adhesion was completed in 2 minutes. The electric power receiving terminals (26) and (26) protpruding at both ends of this product were broken off, thereby making a product. Compared with a conventional case in which

uncure rubber was poured in a mold by holding both ends of a rubber strip, and the temperature thereof was raised to a high temperature, the process could be made extremely simplified.

Example 8

Fig. 11 is a drawing which shows a state in which a support member (31) is fixed to a concrete floor surface through a rubber elastitic body (30). The cross linking composite material (10) used here is the one prepared by forming an electrically conductive heat generating material (2) made of carbon fibers (yarn like heat generating body, specific resistance 10^{-1} to $10^{-(illegible)}$ ohm cm) into a cylinder and by allowing the electric power receiving terminals (26) and (26) at both right and left ends thereof. This electrically conductive heat generating material (2) was obtained by coating and impregnating it with an epoxy resin adhesive agent (Bond E 30, made by Konishi Co., Ltd.).

Under this state, an electric current of 12 V and 0.5 A was allowed to flow through the electrically conductive heat generating material (2) made of carbon fibers from both power supply ends on both sides for 10

minutes, and after this, it was left undisturbed. The temperature at the time when the electric current was flowing therethrough was about 80 ° C. As a result, the support member (31) was firmly adhered to the base section.

Example 9

Fig. 7 shows a case in which one of the members to be adhered is a member made of steel (18) and another a wooden member (19). The electrically conductive heat generating material (2) is an aluminum foil of a thickness of 15 μ. In such a case of adhering, it is possible to use adhesive agents appropriate for a steal one and a wooden one respectively separately. That is to say, as can be seen in this example embodying the present invention, use was made of an epoxy series adhesive agent (made by Dow Chemical Inc., trade name DER 661, hardening agent di -cyan amide was added) of a thermosetting resin as a heat cross linking resin composition for between the member made of steal (18) and the electrically conductive heat generating material (2) and use was made of nylon - 12 (Diamide 2401, made by Dicel Chemical Industry Co., Ltd.)

Of a heat melting resin adhesive agent (32) for between the electrically conductive heat generating material (2) and the wooden member (19). In the case of the above - mentioned configuration, the sizes of the electrically conductive heat generating material (2) and the adhesive agent are 2.7 cm in width and 24 cm in length, and 3 rows of pierced holes of 4 mm ϕ (16 holes each row) are provided on the aluminum foil electrically conductive heat generating material (2). When an electric current of 0.6 V and 12 A was allowed to flow through the cross linking resin compsite material (10) under this condition, either of the adhesive agents was melted in about 10 seconds, and thus it became possible to adhere them. The flow of the electric current was stopped after about 5 minutes during which time the steel member on the lower side becme well wet, and then the upper hot melt adhesive agent was solidified and adhered about 30 seconds later, and the lower epoxy resin assumed a good adhesion state 3 hours later.

[Effects]

As explained above, by the completion of the present invention, it has

become possible to provide heat energy required for cross linking and curing at a location of inner attaching or a work site where it had been difficult to do so.

By this, an adhering process has become extremely easy and simple for internal and external decorative materials in a house or building construction, road construction, attachment of a member to a building after construction, pasting of a maintenance member, manufacturing of products in a plant, etc., and furthermore it has made possible to provide unmaned processing or unmaned assembly by means of a computer controlled machine.

From the view point of a machine and equipment, since formerly and conventionally it has been necessary to provide an heat enerby to a surface area to be adhered, from the outside of an article to be adhered through heat conduction by utilizing a curing vessel, a hot press, a heated mold,etc., the dimension of a machine or equipment has to become large, however, with the present invention, since a surface area to be adhered of a member itself, or the neighborhood thereof is heated, thereby rendering

a heat energy, such a machine or equipment can be made small in size, and the electric power can be efffectively utilized. Furthermore, the adhering time can be shortened.

4. Simple Explanation of the Drawings

Fig. 1 (a) and Fig. 1 (b) are respectively an obliquely seen view and a cross sectional view which show the state of working and processing. Fig. 2 through Fig. 6 are respectively partially broken obliquely seen views of electrically conductive heat generating materials. Fig. 7 is a vertical cross sectional view which shows a work state. Fig. 8 is an obliquely seen view of an intermediate terminal and Fig. 9 is an obliquely seen view which shows the state of use. Fig. 10 and Fig. 11 and Fig. 12 are respectively obliquely seen views which show the states of adhering operations. Fig. 13 shows a circuit diagram. Fig. 14 is a flow sheet.

(1) is a cross linking resin composition, (2) is an electrically conductive heat generating material, (7) is a pierced hole, (10) is a cross linking resin

composite material, (11) is a coil section, (12) is a power supply section, (13) is an output adjusting section, (14) is a detection section, (15) is an operational control section, (26) is an electric power receiving section, (27) is an electric power supply terminal, (28) is an intermediate terminal and (32) is a heat melt type resin adhesive agent.

End

Applicant : Michie Miyamoto

Fig. 1 (a)

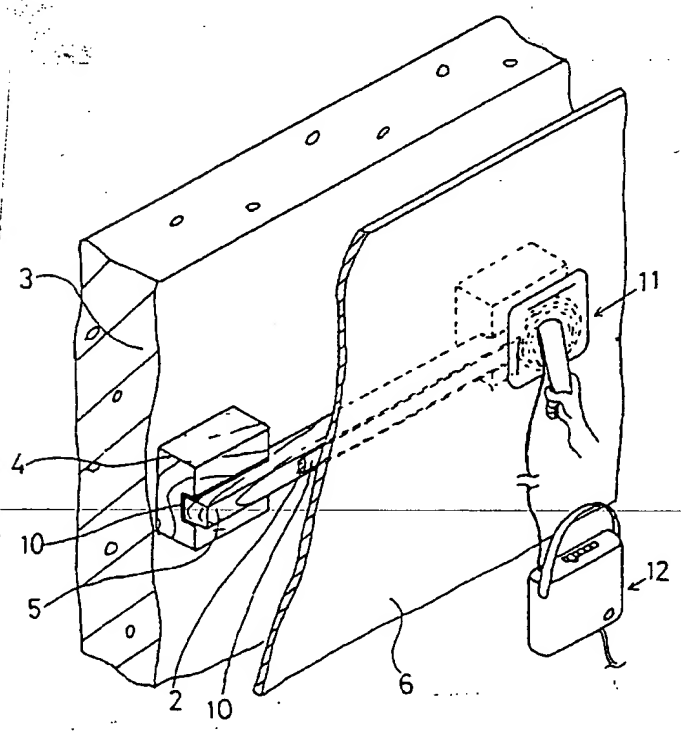


Fig. 1 (b)

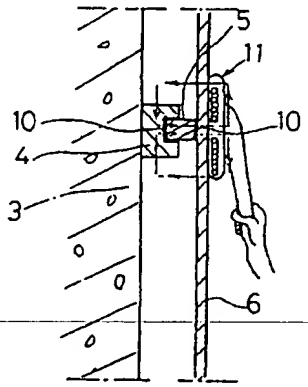


Fig. 2

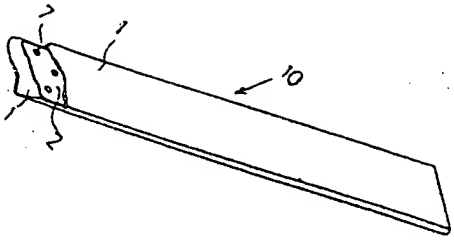


Fig. 3

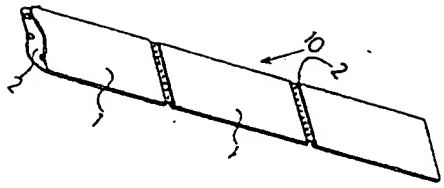


Fig. 4

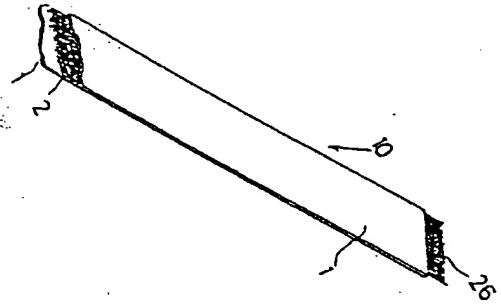


Fig. 5

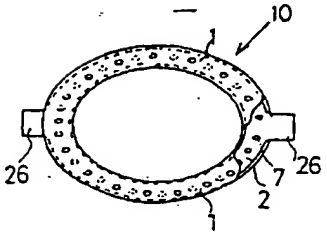


Fig. 6

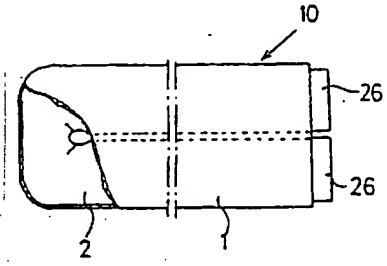


Fig. 7

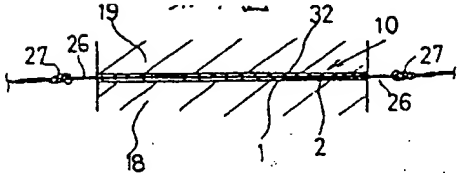


Fig. 8

Fig. 9

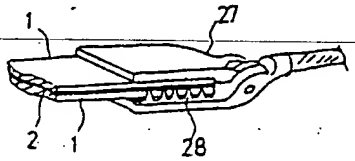


Fig. 10

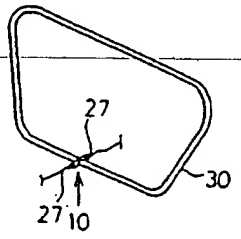


Fig. 11

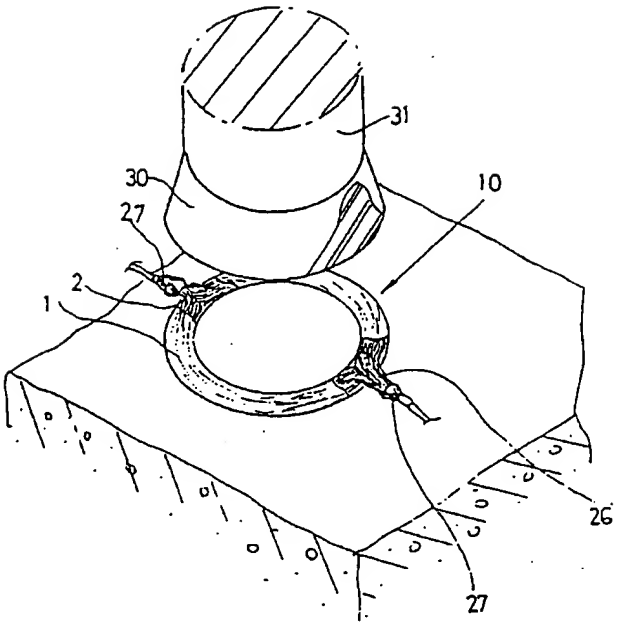


Fig. 12

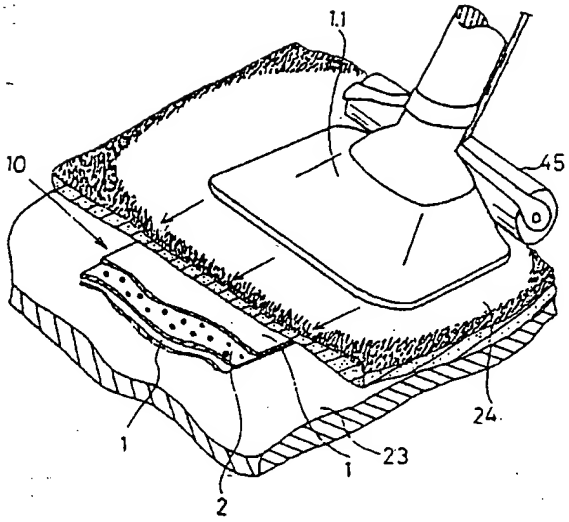


Fig. 13

Key 1 computer

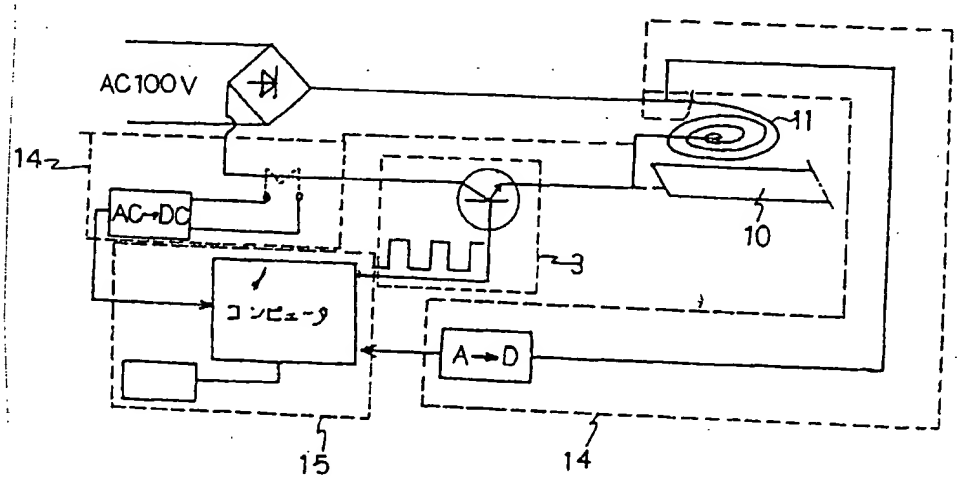
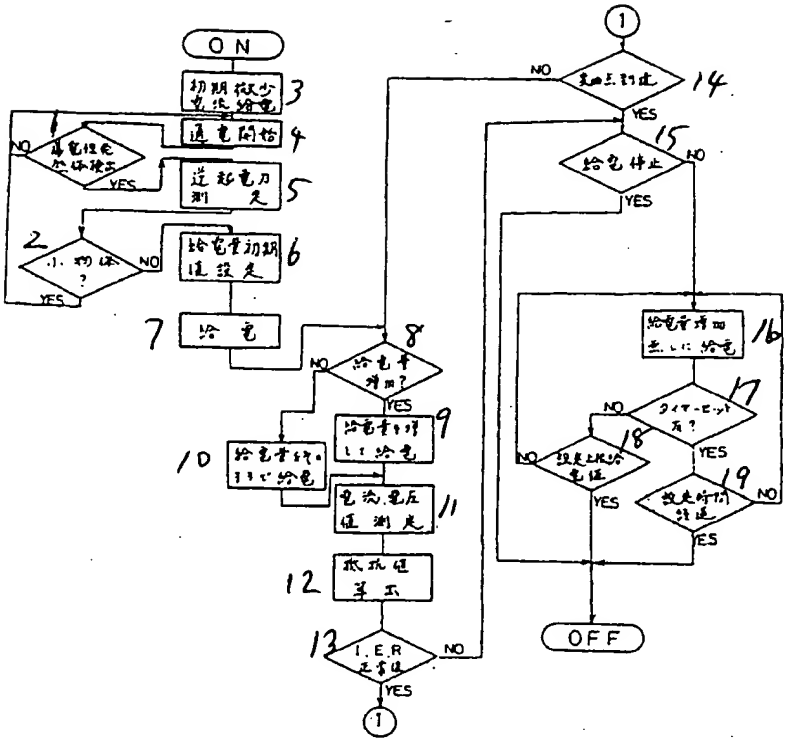


Fig. 14



key 1 detection of an electrically conductive heat generating material, 2 small article ?, 3 initial supply of a minute current, 4 start of supply of current, 5 judging of a counter-electromotive force, 6 setting of initial power supply value, 7 power supply, 8 power supply quantity to be increased ?, 9 power supply by increasing the power supply quantity, 10 power supply by leaving the power supply quantity unchanged, 11 measurement of the current and voltage values, 12 calculation of resistance value, 13 I. E. R. normal value ?, 14 reaching the point of inflexion, 15 stoppage of power supply, 16 power supplied without increasing the power supply quantity, 17 timer setting yes ?, 18 power supply value at the upper limit of setting, 19 reaching the set time

Procedual Amendment (voluntary)

April 30, 1987

To : Director- general, Patent Office, Mr.

3. Title of the Invention

An Adhering Process and a Cross Linking Resin Composite Material and an Adhering Device Used Therefor

3. Amending Party

Relation with the Case : Applicant for Patent

Address No. 1214 - 13, Sohja, Sohja City, Okayama Prefecture

Name Michie Miyamoto (seal impression)

4. Date of the Order for Amendment

voluntary

5. Subject of the Amendment

(1) Column of the Detailed Explanation of the Invention of the Specification

6. Content of the Amendment

(1) "10^{-n}" on the third line of page 20 of the Specification is to be

amended as "10 (illegible)".

(stamp of Patent Office dated May 2, 1987)

Procedual Amendment (voluntary)

January 25, 1988

To : Director- general, Patent Office, Mr.

3. Title of the Invention

An Adhering Process and a Cross Linking Resin Composite Material and an Adhering Device Used Therefor

3. Amending Party

Relation with the Case : Applicant for Patent

Address No. 1214 - 13, Sohja, Sohja City, Okayama Prefecture

Name Michie Miyamoto (seal impression)

4. Date of the Order for Amendment

voluntary

5. Subject of the Amendment

(1) Column of the Detailed Explanation of the Invention of the Specification

(2) Drawing

6. Content of the Amendment

(1) "3000" on the 10thline of page 12 of the Specification is to be amended as "30000".

(2) Fig. 13 is to be replaced by a drawing in which lines coming out from the symbols (2), (12), (16) and (17) are to be added to Fig. 13 and the symbol (3) is to be changed to (13).

7. List of Annexed Document

(1) Drawing (Fig. 13)

(stamp of Patent Office dated Jan. 27, 1988)

Fig. 13 Key 1 computer